UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

Letters sent to State Drinking Water officials in August, 1997

Robert Munari, Chief
Drinking Water Section
Arizona Department of Environmental Quality
3033 North Central Ave
Phoenix, Arizona 85012

Dear Bob:

We are writing to provide you with an update on the perchlorate situation that we discussed during our meeting of August 5, 1997. Since that time additional sampling information has become available and there is more information about treatment technologies. Kevin Mayer in our Superfund program is serving as the EPA, Region 9 coordinator for our response to perchlorate contamination. Attached is an update Kevin has prepared summarizing the status of a number of ongoing activities including recent sampling results from Lake Mead, information on treatment technologies, a proposed health effects study, and efforts to validate the analytical procedures.

Thank you for the prompt response your office has taken to identify potentially affected water systems and to work with those systems to determine if they have perchlorate contamination. In order to help us evaluate the extent of the problems, we would appreciate your keeping us apprised of any perchlorate sampling results that you may have and actions taken in response to any drinking water contamination identified.

As mentioned in our meeting, we believe that the advice and recommended course of action described in the attached California Department of Health Services (CDHS) fact sheet on perchlorate is appropriate based on the existing health effects information. One update to the fact sheet is the addition of another laboratory the state has approved for perchlorate analysis. The state's latest list is another attachment to this letter.

Please call if you have any questions about the attachments and thanks again for helping us ensure that this emerging drinking water issue is appropriately addressed.

Sincerely,

William M. Thurston, Chief
Drinking Water Office

Perchlorate Update, August 20, 1997 **Kevin Mayer, USEPA Region 9**

Analytical: Review of analytical protocol started by EPA. Still some uncertainties

California has supplied us with a 14 page analytical protocol (June 3, 1997) which Ken Brown of the EPA lab in Las Vegas (NERL) has assigned to several of his chemists. He has at least one chemist who had worked at Kerr-McGee and is very experienced with perchlorate. Others, including contractors, also have strong backgrounds. They are curious about verification of the methodology, accuracy of the quantitation, and verification that the perchlorate peak is only perchlorate.

A Nevada laboratory which was referred to as "Lockheed" (but which is now another company) has been analyzing perchlorate using the California protocol. Sample splits with Montgomery-Watson are being analyzed to provide some interlab checking. The Lockheed lab is not "certified" by California.

Source - Nevada: Nevada DEP announces 1700 ppb perchlorate in Las Vegas Wash below Kerr-McGee and PEPCON

After the Southern Nevada Water Authority discovered 11 ppb in its Lake Mead intake and throughout its treatment-distribution system, the state sampled the Las Vegas Wash. It found about 10-14 ppb in the upper reaches of the Wash with one sample at 47 ppb (possibly a model rocket company's waste?). But after the drainage form the Henderson Kerr-McGee/BMI/PEPCON area enters the wash, the perchlorate levels are 1000 to 1700 ppb. This is essentially all groundwater inflow. The wash receives over 100 mgd of treated municipal wastewater.

MWD of Southern California has also released data on perchlorate from recent samples of Lake Mead. Their results also clearly point to Las Vegas Wash (680 ppb in the Wash). From the wash to Hoover Dam, perchlorate concentrations dropped steadily (86, 42, 19, 15). No upstream sources could be detected (Virgin River, Muddy River, Colorado River). MWD also did some depth sampling with interesting results.

Source - Nevada: Cooperation between Nevada DEP and US EPA

Keith Takata, Alexis Strauss and Kevin Mayer had a telephone conference with Nevada DEP (Lou Dodgion and staff) on 8/14 to discuss coordinating investigation and cleanup actions. NDEP has already sampled the wash (see above) and has ordered Kerr-McGee to sample existing groundwater wells (possibly 47 in the area of concern). The sample plan was due this week (before 8/22) and they expect sampling to commence before September.

EPA has offered to investigate residual from PEPCON.

Nevada has asked its contractor to investigate analytical protocols and toxicological information. EPA suggested that we could be of assistance in both areas. Nevada seemed appreciative and willing to use the help.

Full cooperation, to the extent of review of work plans and sharing of results, has been pledged by both agencies. The Southern Nevada Water Authority and local water districts appear anxious that the two agencies work rapidly and effectively. They feel that NDEP has the lead.

Source - Kerr-McGee: Could Kerr-McGee really discharge 400 pounds per day? 100+ ppm ammonium in wells

The EPA chemist familiar with Kerr-McGee's current process was taken aback by the suggestion that hundreds of pounds per day of perchlorate were entering the Colorado. He thought that the

manufacturing process was so expensive, and so controlled to maximize recovery of product, that he would not expect hundreds of pounds per day to be wasted and released. (Colorado River flows at over 10 billion gallons per day or 40 billion liters/day, so at 5 micrograms per liter (ppb) more than 200 kg (400 pounds) are flowing each day)

In response to a reporter's question, Lou Dodgion of NDEP mentioned that groundwater samples from Kerr-McGee in the past had shown 100 to 150 **ppm** of ammonium, which could be an indication of the perchlorate levels if the ammonium was released as ammonium perchlorate.

Treatment - GAC no, Iron or Palladium Catalysts no, Peroxide maybe.

Initial results from the Redlands (California) GAC system showed adsorption of perchlorate, but breakthrough occurred in "...two or three weeks..". This appears to be similar to their experience with nitrate, which may be interpreted as an effect of a surface charge generated in handling the fresh GAC.

Iron, "enhanced iron", and iron pyrite reductants were tried unsuccessfully by contractors for Aerojet. A professor at Stanford tried a palladium catalyst without success. It is certain that thermodynamics favor the reduction of the highly oxidized perchlorate by such reduced material, but the energy required to initiate the reaction is too great. I was informed that manufacture of perchlorate is an electrolytic process consuming a great amount of (electrical) energy (1.4 electron-volts for chloride to perchlorate). The chemist said that the activation energy needed to start a reaction is very high.

We have been informed that a vendor testing a pilot scale ozone-peroxide system to treat solvents in San Gabriel's groundwater discovered a significant removal of perchlorate by their system. Our initial response (and the vendor's response too, according to Sean Hogan) was incredulity at a highly oxidized chemical (perchlorate) being treated by a oxidation process. Subsequent discussions with chemists at USGS and Las Vegas NERL suggests that a reaction between peroxide and perchlorate is not out of the question. Peroxide is very reactive, but actually a weak oxidant. There may be a reaction between peroxide and perchlorate which could result in chlorate (ClO3) or other reduced compounds. It seems worth further work, at least a review of the vendor's results and a check of the thermodynamics of the potential reactions.

Treatment - Reverse Osmosis, Deionization and Biological Treatments are probably effective, costly to maintain

I have been asked about the effectiveness of home RO units. I have responded that since RO and Deionization processes remove chloride anions, they should probably work to treat perchlorate (larger sized, same ionic charge). Of course, an improperly maintained system may not work well at removing chloride or perchlorate. I would not expect water softening processes to have an effect on perchlorate. There is no direct data to support these conclusions.

The Aerojet facility in Rancho Cordova is planning a 5000 gpm biological treatment system. I understand that the plan is to use waste from a food processing plant as the growth medium for their anaerobic digestion, with perchlorate being consumed as a terminal electron acceptor (oxidant).

None of the water districts are enthused at the costs associated with any of these methodologies.

Treatment - $2 million in EPA Science and Technology budget to East Valley Water District (Redlands CA) in FY98

The House budget includes $2M specifically for studying perchlorate treatment technologies in the Crafton-Redlands plume. This is not Superfund money. The money would go to East Valley Water

District, which would contract with American Water Works Association's research foundation. Senator Boxer's staff has indicated they will support this.

Toxicology - 18 ppb considered protective. Citizens question whether level is too high for infants/fetus. Schedule and expected "results" of Air Force 90-day rat study.

Nevada water officials were emphatic that the 18 ppb interim action level established by California is adequately conservative to be protective of infants and pregnant women. "Based on the current information, EPA considers 18ppb of perchlorate in drinking water to be protective of human health."

A number of citizen's groups (CA, NV, Chimahuevi) have contacted me disturbed by the 18 ppb level being used. The 18 ppb is based on an adult study and calculated with an adult's body weight and water intake (70kg, 2 liters/day). One of the uncertainty factors was intended to be protective of high risk populations, which would include infants and fetuses. There are no specific studies of the health or developmental effects on infants and fetuses, although the Air Force's toxicological study is considering these effects to some degree. A physician from NRDC called and was specifically interested in whether perchlorate would pass through the placental barrier, which I could not answer definitively. Mr Robert Hall of Las Vegas was quite adamant that there was no valid basis for the 18 ppb, and that without a solid study on chronic and developmental effects, EPA should recommend that no perchlorate be allowed in drinking water at all. Several citizens (including one from Arizona) asked if their Reverse Osmosis systems would be effective for perchlorate. It was pointed out that poorer households could not be expected to install RO.

Charles Berrey was informed by the Air Force that their toxicological study may provide usable results by June, 1998, in contrast to our earlier estimate that results would not be available until 1999. Charles is checking on the reliability of this estimated schedule. I understand that some parties are expecting that this study will lead to a higher reference dose. We are not sure why they would expect this. The current provisional reference dose is from a human study, so a rat study would not lower the NOAEL. Additionally, few of the uncertainty factors seem to be addressed (Factors for lack of chronic effect study and protectiveness of "at risk" populations would not be lowered, and data certainty factor may not change much either).

Communication - Water Division contacting states. Press interest still high. Letter to Browner drafted. New Jersey site.

Communication within Region 9 has been going well (despite the delays in my messages), both at Upper management and staff levels. Water has contacted their counterparts in all the states of our region, and letters are expected to go out this week to formalize the message. Superfund has drafted a letter to Browner (or appropriate AAs) to ask for national attention in toxicology, treatment, identification of sources nationwide (via DoD, NASA, DoE) and a nationwide communication strategy.

The news media in California and Arizona have been interested in perchlorate since June. The Las Vegas press heavily covered the 8/18 press conference (by local and state officials, with Kevin Mayer attending).

The RPM for a site in New Jersey (Goose Farm) contacted us for policy and analytical information. The site was a dump for "rocket fuel", but perchlorate has not been tested yet.